



The Patches of the Nopol Automatic Repair System on the Bugs of Defects4J version 1.1.0

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The Patches of the Nopol Automatic Repair System on the Bugs of Defects4J version 1.1.0

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Technical report hal-01480084
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This report lists the test-suite adequate patches found by the Nopol automatic repair system [3] on version 1.1.0 of the Defects4J benchmark of bugs [2]. In total, Nopol finds a test-suite adequate patches for 103 different bugs, as shown in Table 1.

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```
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```

We use the Oracle JDK 1.7.0_7 to run Nopol and OpenJDK 1.8.0 for compiling the project Mockito. We give a time budget of three hours to Nopol to find a patch. The experiment has been conducted on machines that are equipped of Xeon X3440 Quad-core processor and 15GB RAM, the machines are part of the Grid5000 infrastructure [1].

Reproduction information:

- Nopol source code: <https://github.com/SpoonLabs/nopol/>.
Commit used: 473964c2d5c668517bd45be1d878074858cb934f
- Defects4j version: <https://github.com/rjust/defects4j/releases/tag/v1.1.0/>
- Execution traces: <https://github.com/Spirals-Team/defects4j-repair/tree/master/results/2017-march/>

1 Chart

Nopol repairs 9 bugs in the project Chart.

1.1 Chart 3

```
--- /tmp/chart_3_Nopol/source/org/jfree/data/time/TimeSeries.java  
+++ /tmp/chart_3_Nopol/source/org/jfree/data/time/TimeSeries.java  
@@ -884,3 +884,3 @@  
     }  
-     if (removed) {
```

Table 1: The number of synthesized test-suite adequate patches for each project.

Project	# Patches	# Bugs	Repair Rate
Chart	9	26	37%
Closure	56	133	42%
Lang	4	65	6%
Math	24	106	22%
Mockito	2	38	5%
Time	8	27	29%
Total	103	395	26%

```
+         if (((removed) && (removed)) || (org.jfree.data.time.TimeSeries.
    DEFAULT_RANGE_DESCRIPTION.length() <= org.jfree.data.time.TimeSeries.this.maxY)) {
        findBoundsByIteration();
```

Listing 1: "The generated patch for the bug Chart 3"

Number of tests that execute the patch: 86

Execution time: 50 seconds

1.2 Chart 4

```
--- /tmp/chart_4_Nopol/source/org/jfree/chart/plot/XYPlot.java
+++ /tmp/chart_4_Nopol/source/org/jfree/chart/plot/XYPlot.java
@@ -1606,3 +1606,5 @@
    public void setRenderer(XYItemRenderer renderer) {
-        setRenderer(0, renderer);
+        if (renderer!=null) {
+            setRenderer(0, renderer);
+        }
    }
```

Listing 2: "The generated patch for the bug Chart 4"

Number of tests that execute the patch: 18

Execution time: 7 minutes, 32 seconds

1.3 Chart 5

```
--- /tmp/chart_5_Nopol/source/org/jfree/data/xy/XYSeries.java
+++ /tmp/chart_5_Nopol/source/org/jfree/data/xy/XYSeries.java
@@ -562,3 +562,3 @@
    // append the value to the list...
-    if (this.autoSort) {
+    if (overwritten!=null) {
        this.data.add(-index - 1, new XYDataItem(x, y));
```

Listing 3: "The generated patch for the bug Chart 5"

Number of tests that execute the patch: 6

Execution time: 38 seconds

1.4 Chart 9

```
--- /tmp/chart_9_Nopol/source/org/jfree/data/time/TimeSeries.java
+++ /tmp/chart_9_Nopol/source/org/jfree/data/time/TimeSeries.java
@@ -882,3 +882,5 @@
    if (end < start) {
-        throw new IllegalArgumentException("Requires start <= end.");
+        if (org.jfree.data.time.TimeSeries.this.data.size() == org.jfree.data.time.
    TimeSeries.this.range.length()) {
+            throw new IllegalArgumentException("Requires start <= end.");
+        }
    }
```

Listing 4: "The generated patch for the bug Chart 9"

Number of tests that execute the patch: 4

Execution time: 34 seconds

1.5 Chart 13

```

--- /tmp/chart_13_Nopol/source/org/jfree/chart/block/BorderArrangement.java
+++ /tmp/chart_13_Nopol/source/org/jfree/chart/block/BorderArrangement.java
@@ -452,9 +452,11 @@
    h[3] = h[2];
    if (this.rightBlock != null) {
        RectangleConstraint c4 = new RectangleConstraint(0.0,
            new Range(0.0, constraint.getWidth() - w[2]),
            LengthConstraintType.RANGE, h[2], null,
            LengthConstraintType.FIXED);
        Size2D size = this.rightBlock.arrange(g2, c4);
        w[3] = size.width;
    }
    if (null!=null) {
        if (this.rightBlock != null) {
            RectangleConstraint c4 = new RectangleConstraint(0.0,
                new Range(0.0, constraint.getWidth() - w[2]),
                LengthConstraintType.RANGE, h[2], null,
                LengthConstraintType.FIXED);
            Size2D size = this.rightBlock.arrange(g2, c4);
            w[3] = size.width;
        }
    }
}

```

Listing 5: "The generated patch for the bug Chart 13"

Number of tests that execute the patch: 2

Execution time: 42 seconds

1.6 Chart 17

```

--- /tmp/chart_17_Nopol/source/org/jfree/data/time/TimeSeries.java
+++ /tmp/chart_17_Nopol/source/org/jfree/data/time/TimeSeries.java
@@ -879,3 +879,5 @@
    if (end < start) {
        throw new IllegalArgumentException("Requires start <= end.");
    }
    if (org.jfree.data.time.TimeSeries.this.data.size() == org.jfree.data.time.
        TimeSeries.this.range.length()) {
        throw new IllegalArgumentException("Requires start <= end.");
    }
}

```

Listing 6: "The generated patch for the bug Chart 17"

Number of tests that execute the patch: 4

Execution time: 33 seconds

1.7 Chart 21

```

--- /tmp/chart_21_Nopol/source/org/jfree/data/Range.java
+++ /tmp/chart_21_Nopol/source/org/jfree/data/Range.java
@@ -334,3 +334,5 @@
    if (!(this.lower == range.lower)) {
        return false;
    }
    if (((1 + org.jfree.data.Range.this.lower) - (-1) < org.jfree.data.Range.this.
        upper) || (org.jfree.data.Range.this.lower <= 0)) {
        return false;
    }
}

```

Listing 7: "The generated patch for the bug Chart 21"

Number of tests that execute the patch: 12

Execution time: 37 seconds

1.8 Chart 25

```

--- /tmp/chart_25_Nopol/source/org/jfree/chart/renderer/category/StatisticalBarRenderer.java
+++ /tmp/chart_25_Nopol/source/org/jfree/chart/renderer/category/StatisticalBarRenderer.java
@@ -206,10 +206,12 @@
    PlotOrientation orientation = plot.getOrientation();
    if (orientation == PlotOrientation.HORIZONTAL) {
        drawHorizontalItem(g2, state, dataArea, plot, domainAxis,
            rangeAxis, statData, row, column);
    }
    if (0 == 1) {
        if (orientation == PlotOrientation.HORIZONTAL) {
            drawHorizontalItem(g2, state, dataArea, plot, domainAxis,
                rangeAxis, statData, row, column);
        }
        else if (orientation == PlotOrientation.VERTICAL) {
            drawVerticalItem(g2, state, dataArea, plot, domainAxis, rangeAxis,
                statData, row, column);
        }
    }
}

```

```

+         }
-     } else if (orientation == PlotOrientation.VERTICAL) {
-         drawVerticalItem(g2, state, dataArea, plot, domainAxis, rangeAxis,
-             statData, row, column);
-     }
- }

```

Listing 8: "The generated patch for the bug Chart 25"

Number of tests that execute the patch: 10

Execution time: 33 seconds

1.9 Chart 26

```

--- /tmp/chart_26_Nopol/source/org/jfree/chart/plot/CategoryPlot.java
+++ /tmp/chart_26_Nopol/source/org/jfree/chart/plot/CategoryPlot.java
@@ -2537,3 +2537,3 @@
     boolean b2 = (area.getHeight() <= MINIMUM_HEIGHT_TO_DRAW);
-    if (b1 || b2) {
+    if (org.jfree.chart.plot.CategoryPlot.DEFAULT_CROSSHAIR_STROKE!=null) {
+        return;

```

Listing 9: "The generated patch for the bug Chart 26"

Number of tests that execute the patch: 48

Execution time: 1 minute, 40 seconds

2 Closure

Nopol repairs 56 bugs in the project Closure.

2.1 Closure 1

```

--- /tmp/closure_1_Nopol/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_1_Nopol/src/com/google/javascript/rhino/Node.java
@@ -1410,7 +1410,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if ((node2.type) != (com.google.javascript.rhino.Node.this.type)) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }

```

Listing 10: "The generated patch for the bug Closure 1"

Number of tests that execute the patch: 15

Execution time: 2 minutes, 4 seconds

2.2 Closure 2

```

--- /tmp/closure_2_Nopol/src/com/google/javascript/jscomp/TypeCheck.java
+++ /tmp/closure_2_Nopol/src/com/google/javascript/jscomp/TypeCheck.java
@@ -1663,4 +1663,6 @@
     currentProperties.clear();
-    checkInterfaceConflictProperties(t, n, functionPrivateName,
-        properties, currentProperties, interfaceType);
+    if (com.google.javascript.jscomp.TypeCheck.this.unknownCount < com.google.javascript
+        .jscomp.TypeCheck.this.typedCount) {
+        checkInterfaceConflictProperties(t, n, functionPrivateName,
+            properties, currentProperties, interfaceType);
+    }
     properties.putAll(currentProperties);

```

Listing 11: "The generated patch for the bug Closure 2"

Number of tests that execute the patch: 17

Execution time: 2 minutes, 7 seconds

2.3 Closure 3

```

--- /tmp/closure_3_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_3_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1410,7 +1410,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            INFERRED_FUNCTION) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
}

```

Listing 12: "The generated patch for the bug Closure 3"

Number of tests that execute the patch: 10

Execution time: 7 minutes, 8 seconds

2.4 Closure 5

```

--- /tmp/closure_5_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_5_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1410,7 +1410,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            INFERRED_FUNCTION) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
}

```

Listing 13: "The generated patch for the bug Closure 5"

Number of tests that execute the patch: 8

Execution time: 1 minute, 51 seconds

2.5 Closure 7

```

--- /tmp/closure_7_Nop01/src/com/google/javascript/rhino/testing/Asserts.java
+++ /tmp/closure_7_Nop01/src/com/google/javascript/rhino/testing/Asserts.java
@@ -102,3 +102,3 @@
     (a == null) == (b == null));
-    if (a == null) {
+    if (message != null) {
+        return;
     }
}

```

Listing 14: "The generated patch for the bug Closure 7"

Number of tests that execute the patch: 358

Execution time: 3 minutes, 26 seconds

2.6 Closure 8

```

--- /tmp/closure_8_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_8_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1410,7 +1410,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            INFERRED_FUNCTION) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +

```

```

+         "\n\nTree2:\n" + node2.toStringTree() +
+         "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+         "\n\nSubtree2: " + diff.nodeB.toStringTree();
+     }
+ }

```

Listing 15: "The generated patch for the bug Closure 8"

Number of tests that execute the patch: 8

Execution time: 2 minutes, 28 seconds

2.7 Closure 10

```

--- /tmp/closure_10_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_10_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1432,7 +1432,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            QUOTED_PROP) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
+    }
+ }

```

Listing 16: "The generated patch for the bug Closure 10"

Number of tests that execute the patch: 8

Execution time: 4 minutes, 28 seconds

2.8 Closure 12

```

--- /tmp/closure_12_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_12_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1432,7 +1432,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            QUOTED_PROP) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
+    }
+ }

```

Listing 17: "The generated patch for the bug Closure 12"

Number of tests that execute the patch: 8

Execution time: 7 minutes, 35 seconds

2.9 Closure 14

```

--- /tmp/closure_14_Nop01/src/com/google/javascript/jscomp/ControlFlowAnalysis.java
+++ /tmp/closure_14_Nop01/src/com/google/javascript/jscomp/ControlFlowAnalysis.java
@@ -663,3 +663,5 @@
     } else {
-        finallyMap.put(lastJump, null);
+        if (com.google.javascript.jscomp.ControlFlowAnalysis.this.shouldTraverseFunctions) {
+            finallyMap.put(lastJump, null);
+        }
+    }
+ }

```

Listing 18: "The generated patch for the bug Closure 14"

Number of tests that execute the patch: 7

Execution time: 3 minutes, 2 seconds

2.10 Closure 15

```
--- /tmp/closure_15_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_15_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < 32) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```

Listing 19: "The generated patch for the bug Closure 15"

Number of tests that execute the patch: 8

Execution time: 7 minutes, 28 seconds

2.11 Closure 16

```
--- /tmp/closure_16_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_16_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1445,3 +1445,5 @@
     if (!isEquivalentTo(node2, false, false)) {
-        return new NodeMismatch(this, node2);
+        if (com.google.javascript.rhino.Node.this.sourcePosition <= 1) {
+            return new NodeMismatch(this, node2);
+        }
     }
```

Listing 20: "The generated patch for the bug Closure 16"

Number of tests that execute the patch: 12

Execution time: 4 minutes, 12 seconds

2.12 Closure 17

```
--- /tmp/closure_17_Nop1/src/com/google/javascript/jscomp/TypedScopeCreator.java
+++ /tmp/closure_17_Nop1/src/com/google/javascript/jscomp/TypedScopeCreator.java
@@ -1294,3 +1294,5 @@
     // then we can safely use that.
-    return rValue.getJSType();
+    if (!(com.google.javascript.jscomp.TypedScopeCreator.DELEGATE_PROXY_SUFFIX.
+        length() == -1 + com.google.javascript.jscomp.TypedScopeCreator.this.
+        functionAnalysisResults.size())) {
+        return rValue.getJSType();
+    }
+    } else if (rValue.isOr()) {
```

Listing 21: "The generated patch for the bug Closure 17"

Number of tests that execute the patch: 25

Execution time: 2 minutes, 1 second

2.13 Closure 18

```
--- /tmp/closure_18_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_18_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            IS_DISPATCHER) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```



```

+         "\n\nSubtree2: " + diff.nodeB.toStringTree();
+     }
+ }

```

Listing 22: "The generated patch for the bug Closure 18"

Number of tests that execute the patch: 8

Execution time: 1 minute, 51 seconds

2.14 Closure 20

```

--- /tmp/closure_20_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_20_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < 32) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }

```

Listing 23: "The generated patch for the bug Closure 20"

Number of tests that execute the patch: 8

Execution time: 2 minutes

2.15 Closure 21

```

--- /tmp/closure_21_Nop01/src/com/google/javascript/jscomp/CheckSideEffects.java
+++ /tmp/closure_21_Nop01/src/com/google/javascript/jscomp/CheckSideEffects.java
@@ -117,7 +117,9 @@
     if (n == parent.getLastChild()) {
-        for (Node an : parent.getAncestors()) {
-            int ancestorType = an.getType();
-            if (ancestorType == Token.COMMA) continue;
-            if (ancestorType != Token.EXPR_RESULT && ancestorType != Token.BLOCK) return;
-            else break;
+        if (com.google.javascript.jscomp.CheckSideEffects.PROTECTOR_FN.length()==0) {
+            for (Node an : parent.getAncestors()) {
+                int ancestorType = an.getType();
+                if (ancestorType == Token.COMMA) continue;
+                if (ancestorType != Token.EXPR_RESULT && ancestorType != Token.BLOCK) return;
+                else break;
+            }
+        }
     }
 }

```

Listing 24: "The generated patch for the bug Closure 21"

Number of tests that execute the patch: 2

Execution time: 1 minute, 59 seconds

2.16 Closure 22

```

--- /tmp/closure_22_Nop01/src/com/google/javascript/jscomp/CheckSideEffects.java
+++ /tmp/closure_22_Nop01/src/com/google/javascript/jscomp/CheckSideEffects.java
@@ -115,6 +115,8 @@
         continue;
-        if (ancestorType != Token.EXPR_RESULT && ancestorType != Token.BLOCK)
+        if (com.google.javascript.jscomp.CheckSideEffects.PROTECTOR_FN.length()==0) {
+            if (ancestorType != Token.EXPR_RESULT && ancestorType != Token.BLOCK)
+                return;
+            else
+                break;
+        }
     }
 }

```

Listing 25: "The generated patch for the bug Closure 22"

Number of tests that execute the patch: 3

Execution time: 2 minutes, 24 seconds

2.17 Closure 26

```
--- /tmp/closure_26_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_26_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if ((com.google.javascript.rhino.Node.this.type) != (node2.type)) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```

Listing 26: "The generated patch for the bug Closure 26"

Number of tests that execute the patch: 14

Execution time: 3 minutes, 34 seconds

2.18 Closure 28

```
--- /tmp/closure_28_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_28_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < 32) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```

Listing 27: "The generated patch for the bug Closure 28"

Number of tests that execute the patch: 8

Execution time: 1 minute, 55 seconds

2.19 Closure 29

```
--- /tmp/closure_29_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_29_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if ((com.google.javascript.rhino.Node.this.type) != (node2.type)) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```

Listing 28: "The generated patch for the bug Closure 29"

Number of tests that execute the patch: 12

Execution time: 2 minutes

2.20 Closure 30

```

--- /tmp/closure_30_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_30_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < 32) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }

```

Listing 29: "The generated patch for the bug Closure 30"

Number of tests that execute the patch: 5

Execution time: 1 minute, 45 seconds

2.21 Closure 31

```

--- /tmp/closure_31_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_31_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            IS_DISPATCHER) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }

```

Listing 30: "The generated patch for the bug Closure 31"

Number of tests that execute the patch: 3

Execution time: 1 minute, 54 seconds

2.22 Closure 33

```

--- /tmp/closure_33_Nop1/src/com/google/javascript/rhino/jstype/PrototypeObjectType.java
+++ /tmp/closure_33_Nop1/src/com/google/javascript/rhino/jstype/PrototypeObjectType.java
@@ -572,4 +572,6 @@
     if (!hasProperty(prop)) {
-        typeToInfer = getNativeType(JSTypeNative.VOID_TYPE)
-            .getLeastSupertype(propType);
+        if (com.google.javascript.rhino.jstype.PrototypeObjectType.this.prettyPrint) {
+            typeToInfer = getNativeType(JSTypeNative.VOID_TYPE)
+                .getLeastSupertype(propType);
+        }
     }
 }

```

Listing 31: "The generated patch for the bug Closure 33"

Number of tests that execute the patch: 8

Execution time: 1 minute, 52 seconds

2.23 Closure 35

```

--- /tmp/closure_35_Nop1/src/com/google/javascript/rhino/jstype/JSTypeRegistry.java
+++ /tmp/closure_35_Nop1/src/com/google/javascript/rhino/jstype/JSTypeRegistry.java
@@ -1654,8 +1654,10 @@
    // Add the property to the record.
-    if (builder.addProperty(fieldName, fieldType, fieldNameNode) == null) {
-        // Duplicate field name, warning and skip
-        reporter.warning(
-            "Duplicate record field " + fieldName,
-            sourceName,
-            n.getLineno(), fieldNameNode.getCharno());
+    }
+    if (builder.addProperty(fieldName, fieldType, fieldNameNode) == null) {
+        // Duplicate field name, warning and skip
+        reporter.warning(
+            "Duplicate record field " + fieldName,
+            sourceName,
+            n.getLineno(), fieldNameNode.getCharno());
+    }

```

```

+     if ((fieldName.length()) != (5)) {
+         if (builder.addProperty(fieldName, fieldType, fieldNameNode) == null) {
+             // Duplicate field name, warning and skip
+             reporter.warning(
+                 "Duplicate record field " + fieldName,
+                 sourceName,
+                 n.getLineno(), fieldNameNode.getCharno());
+         }
+     }
+ }

```

Listing 32: "The generated patch for the bug Closure 35"

Number of tests that execute the patch: 26

Execution time: 2 minutes, 43 seconds

2.24 Closure 36

```

--- /tmp/closure_36_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_36_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1416,7 +1416,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            IS_DISPATCHER) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
+    }
+ }

```

Listing 33: "The generated patch for the bug Closure 36"

Number of tests that execute the patch: 3

Execution time: 1 minute, 48 seconds

2.25 Closure 38

```

--- /tmp/closure_38_Nop01/src/com/google/javascript/jscomp/CodeConsumer.java
+++ /tmp/closure_38_Nop01/src/com/google/javascript/jscomp/CodeConsumer.java
@@ -244,3 +244,3 @@
     boolean negativeZero = isNegativeZero(x);
-    if (x < 0 && prev == '-') {
+    if ((prev == '-') {
+        add(" ");

```

Listing 34: "The generated patch for the bug Closure 38"

Number of tests that execute the patch: 1665

Execution time: 3 minutes, 11 seconds

2.26 Closure 40

```

--- /tmp/closure_40_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_40_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1411,7 +1411,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < 32) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
+    }
+ }

```

Listing 35: "The generated patch for the bug Closure 40"

Number of tests that execute the patch: 3

Execution time: 2 minutes, 7 seconds

2.27 Closure 45

```
--- /tmp/closure_45_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_45_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1403,7 +1403,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < 32) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```

Listing 36: "The generated patch for the bug Closure 45"

Number of tests that execute the patch: 3

Execution time: 1 minute, 41 seconds

2.28 Closure 49

```
--- /tmp/closure_49_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_49_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1566,7 +1566,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < 29) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```

Listing 37: "The generated patch for the bug Closure 49"

Number of tests that execute the patch: 68

Execution time: 1 minute, 47 seconds

2.29 Closure 50

```
--- /tmp/closure_50_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_50_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1566,7 +1566,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            LABEL_PROP) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
```

Listing 38: "The generated patch for the bug Closure 50"

Number of tests that execute the patch: 4

Execution time: 1 minute, 50 seconds

2.30 Closure 55

```

--- /tmp/closure_55_Nopol/src/com/google/javascript/jscomp/FunctionRewriter.java
+++ /tmp/closure_55_Nopol/src/com/google/javascript/jscomp/FunctionRewriter.java
@@ -92,10 +92,12 @@
    // reductions if doing so will result in some savings.
-    if (savings > (helperCodeCost + SAVINGS_THRESHOLD)) {
-        for (Reduction reduction : reductions) {
-            reduction.apply();
+    if (((1) != (reductions.size())) && (!(reducers.size() < reductions.size())) {
+        if (savings > (helperCodeCost + SAVINGS_THRESHOLD)) {
+            for (Reduction reduction : reductions) {
+                reduction.apply();
+            }
+
+            Node addingRoot = compiler.getNodeForCodeInsertion(null);
+            addingRoot.addChildrenToFront(helperCode);
+            compiler.reportCodeChange();
+        }
+
+        Node addingRoot = compiler.getNodeForCodeInsertion(null);
+        addingRoot.addChildrenToFront(helperCode);
+        compiler.reportCodeChange();
    }
}

```

Listing 39: "The generated patch for the bug Closure 55"

Number of tests that execute the patch: 11

Execution time: 2 minutes, 14 seconds

2.31 Closure 60

```

--- /tmp/closure_60_Nopol/src/com/google/javascript/jscomp/PeepholeSubstituteAlternateSyntax.java
+++ /tmp/closure_60_Nopol/src/com/google/javascript/jscomp/PeepholeSubstituteAlternateSyntax.java
@@ -1196,3 +1196,5 @@
    if (!newNode.isEquivalentTo(n)) {
-        parent.replaceChild(n, newNode);
+        if (com.google.javascript.jscomp.PeepholeSubstituteAlternateSyntax.this.late) {
+            parent.replaceChild(n, newNode);
+        }
+        reportCodeChange();
    }
}

```

Listing 40: "The generated patch for the bug Closure 60"

Number of tests that execute the patch: 31

Execution time: 12 minutes, 12 seconds

2.32 Closure 61

```

--- /tmp/closure_61_Nopol/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_61_Nopol/src/com/google/javascript/rhino/Node.java
@@ -1460,7 +1460,9 @@
    if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if ((com.google.javascript.rhino.Node.this.type) != (node2.type)) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
    }
}

```

Listing 41: "The generated patch for the bug Closure 61"

Number of tests that execute the patch: 4

Execution time: 1 minute, 39 seconds

2.33 Closure 62

```

--- /tmp/closure_62_Nopol/src/com/google/javascript/jscomp/LightweightMessageFormatter.java
+++ /tmp/closure_62_Nopol/src/com/google/javascript/jscomp/LightweightMessageFormatter.java
@@ -96,4 +96,3 @@
    // at the end of the line
-    if (excerpt.equals(LINE)
-        && 0 <= charno && charno < sourceExcerpt.length()) {

```

```
+     if (error!=null) {
+         for (int i = 0; i < charno; i++) {
```

Listing 42: "The generated patch for the bug Closure 62"

Number of tests that execute the patch: 5

Execution time: 1 minute, 32 seconds

2.34 Closure 63

```
--- /tmp/closure_63_Nop01/src/com/google/javascript/jscomp/LightweightMessageFormatter.java
+++ /tmp/closure_63_Nop01/src/com/google/javascript/jscomp/LightweightMessageFormatter.java
@@ -96,4 +96,3 @@
+     // at the end of the line
-     if (excerpt.equals(LINE)
-         && 0 <= charno && charno < sourceExcerpt.length()) {
+     if (error!=null) {
+         for (int i = 0; i < charno; i++) {
```

Listing 43: "The generated patch for the bug Closure 63"

Number of tests that execute the patch: 5

Execution time: 1 minute, 31 seconds

2.35 Closure 66

```
--- /tmp/closure_66_Nop01/src/com/google/javascript/jscomp/TypeCheck.java
+++ /tmp/closure_66_Nop01/src/com/google/javascript/jscomp/TypeCheck.java
@@ -821,3 +821,5 @@
+     if (type == null) {
-         nullCount++;
+         if (com.google.javascript.jscomp.TypeCheck.this.inExterns) {
+             nullCount++;
+         }
+     } else if (type.isUnknownType()) {
```

Listing 44: "The generated patch for the bug Closure 66"

Number of tests that execute the patch: 166

Execution time: 2 minutes, 21 seconds

2.36 Closure 67

```
--- /tmp/closure_67_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_67_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1384,7 +1384,9 @@
+     if (diff != null) {
-         return "Node tree inequality:" +
-             "\nTree1:\n" + toStringTree() +
-             "\n\nTree2:\n" + node2.toStringTree() +
-             "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-             "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         if ((com.google.javascript.rhino.Node.this.type) != (node2.type)) {
+             return "Node tree inequality:" +
+                 "\nTree1:\n" + toStringTree() +
+                 "\n\nTree2:\n" + node2.toStringTree() +
+                 "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                 "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         }
+     }
+ }
```

Listing 45: "The generated patch for the bug Closure 67"

Number of tests that execute the patch: 2

Execution time: 1 minute, 37 seconds

2.37 Closure 72

```
--- /tmp/closure_72_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_72_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1381,7 +1381,9 @@
+     if (diff != null) {
-         return "Node tree inequality:" +
-             "\nTree1:\n" + toStringTree() +
-             "\n\nTree2:\n" + node2.toStringTree() +
-             "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-             "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         if ((com.google.javascript.rhino.Node.this.type) != (node2.type)) {
+             return "Node tree inequality:" +
```

```

+         "\nTree1:\n" + toStringTree() +
+         "\n\nTree2:\n" + node2.toStringTree() +
+         "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+         "\n\nSubtree2: " + diff.nodeB.toStringTree();
+     }
}

```

Listing 46: "The generated patch for the bug Closure 72"

Number of tests that execute the patch: 2

Execution time: 1 minute, 32 seconds

2.38 Closure 75

```

--- /tmp/closure_75_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_75_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1410,3 +1410,5 @@
     }
-    res = n.checkTreeEqualsImpl(n2);
+    if (com.google.javascript.rhino.Node.PROPERTY_FLAG == com.google.javascript.rhino.Node.
+        this.first.getType()) {
+        res = n.checkTreeEqualsImpl(n2);
+    }
+    if (res != null) {

```

Listing 47: "The generated patch for the bug Closure 75"

Number of tests that execute the patch: 3164

Execution time: 24 minutes, 1 second

2.39 Closure 76

```

--- /tmp/closure_76_Nop1/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_76_Nop1/src/com/google/javascript/rhino/Node.java
@@ -1368,7 +1368,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (node2.type < com.google.javascript.rhino.Node.FUNCTION_PROP) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
}

```

Listing 48: "The generated patch for the bug Closure 76"

Number of tests that execute the patch: 5

Execution time: 1 minute, 30 seconds

2.40 Closure 78

```

--- /tmp/closure_78_Nop1/src/com/google/javascript/jscomp/PeepholeFoldConstants.java
+++ /tmp/closure_78_Nop1/src/com/google/javascript/jscomp/PeepholeFoldConstants.java
@@ -717,3 +717,5 @@
     if (rval == 0) {
-        error(DiagnosticType.error("JSC_DIVIDE_BY_0_ERROR", "Divide by 0"), right);
+        if (53 == 0) {
+            error(DiagnosticType.error("JSC_DIVIDE_BY_0_ERROR", "Divide by 0"), right);
+        }
+        return null;

```

Listing 49: "The generated patch for the bug Closure 78"

Number of tests that execute the patch: 1

Execution time: 1 minute, 25 seconds

2.41 Closure 111

```

--- /tmp/closure_111_Nop1/src/com/google/javascript/rhino/testing/Asserts.java
+++ /tmp/closure_111_Nop1/src/com/google/javascript/rhino/testing/Asserts.java
@@ -102,3 +102,3 @@
     (a == null) == (b == null));
-    if (a == null) {

```



```
+   if (message!=null) {
+       return;
```

Listing 50: "The generated patch for the bug Closure 111"

Number of tests that execute the patch: 381

Execution time: 2 minutes, 49 seconds

2.42 Closure 113

```
--- /tmp/closure_113_Nopol/src/com/google/javascript/jscomp/ProcessClosurePrimitives.java
+++ /tmp/closure_113_Nopol/src/com/google/javascript/jscomp/ProcessClosurePrimitives.java
@@ -328,3 +328,3 @@
+   // let them be caught in the subsequent run.
+   if (provided != null) {
+   if ((provided!=null) || (!(ns.length() < 10))) {
+       parent.detachFromParent();
```

Listing 51: "The generated patch for the bug Closure 113"

Number of tests that execute the patch: 26

Execution time: 2 minutes, 22 seconds

2.43 Closure 114

```
--- /tmp/closure_114_Nopol/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_114_Nopol/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
+   if (diff != null) {
+       return "Node tree inequality:" +
+       "\nTree1:\n" + toStringTree() +
+       "\n\nTree2:\n" + node2.toStringTree() +
+       "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+       "\n\nSubtree2: " + diff.nodeB.toStringTree();
+   if (node2.type < com.google.javascript.rhino.Node.JSDOC_INFO_PROP) {
+       return "Node tree inequality:" +
+       "\nTree1:\n" + toStringTree() +
+       "\n\nTree2:\n" + node2.toStringTree() +
+       "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+       "\n\nSubtree2: " + diff.nodeB.toStringTree();
+   }
+   }
```

Listing 52: "The generated patch for the bug Closure 114"

Number of tests that execute the patch: 8

Execution time: 2 minutes, 14 seconds

2.44 Closure 115

```
--- /tmp/closure_115_Nopol/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_115_Nopol/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
+   if (diff != null) {
+       return "Node tree inequality:" +
+       "\nTree1:\n" + toStringTree() +
+       "\n\nTree2:\n" + node2.toStringTree() +
+       "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+       "\n\nSubtree2: " + diff.nodeB.toStringTree();
+   if (node2.type < com.google.javascript.rhino.Node.JSDOC_INFO_PROP) {
+       return "Node tree inequality:" +
+       "\nTree1:\n" + toStringTree() +
+       "\n\nTree2:\n" + node2.toStringTree() +
+       "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+       "\n\nSubtree2: " + diff.nodeB.toStringTree();
+   }
+   }
```

Listing 53: "The generated patch for the bug Closure 115"

Number of tests that execute the patch: 14

Execution time: 2 minutes, 18 seconds

2.45 Closure 116

```
--- /tmp/closure_116_Nopol/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_116_Nopol/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
+   if (diff != null) {
```

```

-         return "Node tree inequality:" +
-             "\nTree1:\n" + toStringTree() +
-             "\n\nTree2:\n" + node2.toStringTree() +
-             "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-             "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         if (node2.type < com.google.javascript.rhino.Node.JSDOC_INFO_PROP) {
+             return "Node tree inequality:" +
+                 "\nTree1:\n" + toStringTree() +
+                 "\n\nTree2:\n" + node2.toStringTree() +
+                 "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                 "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         }
    }
}

```

Listing 54: "The generated patch for the bug Closure 116"

Number of tests that execute the patch: 13

Execution time: 2 minutes, 13 seconds

2.46 Closure 119

```

--- /tmp/closure_119_Nop01/src/com/google/javascript/jscomp/GlobalNamespace.java
+++ /tmp/closure_119_Nop01/src/com/google/javascript/jscomp/GlobalNamespace.java
@@ -690,3 +690,5 @@
-
+         handleGet(module, scope, n, parent, name, type);
+         if (((com.google.javascript.jscomp.GlobalNamespace.this.externsRoot!=null) && ((-1) !=
+             ((2) - (com.google.javascript.jscomp.GlobalNamespace.this.globalNames.size())))) || (!(com.
+             google.javascript.jscomp.GlobalNamespace.this.externsScope!=null))) {
+             handleGet(module, scope, n, parent, name, type);
+         }
    }
}

```

Listing 55: "The generated patch for the bug Closure 119"

Number of tests that execute the patch: 394

Execution time: 32 minutes, 2 seconds

2.47 Closure 120

```

--- /tmp/closure_120_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_120_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
-         if (diff != null) {
-             return "Node tree inequality:" +
-                 "\nTree1:\n" + toStringTree() +
-                 "\n\nTree2:\n" + node2.toStringTree() +
-                 "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-                 "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         if (node2.type < com.google.javascript.rhino.Node.JSDOC_INFO_PROP) {
+             return "Node tree inequality:" +
+                 "\nTree1:\n" + toStringTree() +
+                 "\n\nTree2:\n" + node2.toStringTree() +
+                 "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                 "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         }
    }
}

```

Listing 56: "The generated patch for the bug Closure 120"

Number of tests that execute the patch: 8

Execution time: 2 minutes, 11 seconds

2.48 Closure 121

```

--- /tmp/closure_121_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_121_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1429,7 +1429,9 @@
-         if (diff != null) {
-             return "Node tree inequality:" +
-                 "\nTree1:\n" + toStringTree() +
-                 "\n\nTree2:\n" + node2.toStringTree() +
-                 "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-                 "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         if (node2.type < com.google.javascript.rhino.Node.JSDOC_INFO_PROP) {
+             return "Node tree inequality:" +
+                 "\nTree1:\n" + toStringTree() +
+                 "\n\nTree2:\n" + node2.toStringTree() +
+                 "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                 "\n\nSubtree2: " + diff.nodeB.toStringTree();
+         }
    }
}

```

```
+
}
```

Listing 57: "The generated patch for the bug Closure 121"

Number of tests that execute the patch: 8

Execution time: 2 minutes, 12 seconds

2.49 Closure 124

```
--- /tmp/closure_124_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_124_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1427,7 +1427,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (node2.type < com.google.javascript.rhino.Node.SIDE_EFFECT_FLAGS) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }
```

Listing 58: "The generated patch for the bug Closure 124"

Number of tests that execute the patch: 8

Execution time: 17 minutes, 49 seconds

2.50 Closure 126

```
--- /tmp/closure_126_Nop01/src/com/google/javascript/jscomp/MinimizeExitPoints.java
+++ /tmp/closure_126_Nop01/src/com/google/javascript/jscomp/MinimizeExitPoints.java
@@ -142,3 +142,5 @@
     Node finallyBlock = n.getLastChild();
-    tryMinimizeExits(finallyBlock, exitType, labelName);
+    if (0 == 1) {
+        tryMinimizeExits(finallyBlock, exitType, labelName);
+    }
 }
```

Listing 59: "The generated patch for the bug Closure 126"

Number of tests that execute the patch: 2

Execution time: 2 minutes, 1 second

2.51 Closure 127

```
--- /tmp/closure_127_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_127_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1427,7 +1427,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (node2.type < com.google.javascript.rhino.Node.SIDE_EFFECT_FLAGS) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }
```

Listing 60: "The generated patch for the bug Closure 127"

Number of tests that execute the patch: 13

Execution time: 2 minutes, 4 seconds

2.52 Closure 129

```

--- /tmp/closure_129_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_129_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1427,7 +1427,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type < node2.type) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }

```

Listing 61: "The generated patch for the bug Closure 129"

Number of tests that execute the patch: 8

Execution time: 2 minutes, 18 seconds

2.53 Closure 130

```

--- /tmp/closure_130_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_130_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1416,7 +1416,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            INFERRED_FUNCTION) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }

```

Listing 62: "The generated patch for the bug Closure 130"

Number of tests that execute the patch: 8

Execution time: 2 minutes, 3 seconds

2.54 Closure 131

```

--- /tmp/closure_131_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_131_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1416,7 +1416,9 @@
     if (diff != null) {
-        return "Node tree inequality:" +
-            "\nTree1:\n" + toStringTree() +
-            "\n\nTree2:\n" + node2.toStringTree() +
-            "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-            "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+            INFERRED_FUNCTION) {
+            return "Node tree inequality:" +
+                "\nTree1:\n" + toStringTree() +
+                "\n\nTree2:\n" + node2.toStringTree() +
+                "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+                "\n\nSubtree2: " + diff.nodeB.toStringTree();
+        }
     }
 }

```

Listing 63: "The generated patch for the bug Closure 131"

Number of tests that execute the patch: 9

Execution time: 2 minutes, 21 seconds

2.55 Closure 132

```

--- /tmp/closure_132_Nop01/src/com/google/javascript/rhino/Node.java
+++ /tmp/closure_132_Nop01/src/com/google/javascript/rhino/Node.java
@@ -1416,7 +1416,9 @@

```

```

    if (diff != null) {
-       return "Node tree inequality:" +
-           "\nTree1:\n" + toStringTree() +
-           "\n\nTree2:\n" + node2.toStringTree() +
-           "\n\nSubtree1: " + diff.nodeA.toStringTree() +
-           "\n\nSubtree2: " + diff.nodeB.toStringTree();
+       if (com.google.javascript.rhino.Node.this.type <= com.google.javascript.rhino.Node.
+   INFERRED_FUNCTION) {
+           return "Node tree inequality:" +
+               "\nTree1:\n" + toStringTree() +
+               "\n\nTree2:\n" + node2.toStringTree() +
+               "\n\nSubtree1: " + diff.nodeA.toStringTree() +
+               "\n\nSubtree2: " + diff.nodeB.toStringTree();
+       }
    }
}

```

Listing 64: "The generated patch for the bug Closure 132"

Number of tests that execute the patch: 8

Execution time: 2 minutes, 25 seconds

2.56 Closure 133

```

--- /tmp/closure_133_Nopol/src/com/google/javascript/jscomp/parsing/JsDocInfoParser.java
+++ /tmp/closure_133_Nopol/src/com/google/javascript/jscomp/parsing/JsDocInfoParser.java
@@ -1412,4 +1412,3 @@
-
-   if (token == JsDocToken.EOC || token == JsDocToken.EOL ||
-       token == JsDocToken.EOF) {
+   if (com.google.javascript.jscomp.parsing.JsDocInfoParser.this.unreadToken!=null) {
+       return new ExtractionInfo("", token);

```

Listing 65: "The generated patch for the bug Closure 133"

Number of tests that execute the patch: 254

Execution time: 4 minutes, 22 seconds

3 Lang

Nopol repairs 4 bugs in the project Lang.

3.1 Lang 44

```

--- /tmp/lang_44_Nopol/src/java/org/apache/commons/lang/NumberUtils.java
+++ /tmp/lang_44_Nopol/src/java/org/apache/commons/lang/NumberUtils.java
@@ -192,5 +192,3 @@
-       case 'L' :
-           if (dec == null
-               && exp == null
-               && (numeric.charAt(0) == '-' && isDigits(numeric.substring(1)) ||
-                   isDigits(numeric))) {
+           if (((dec == null) && (exp == null))) {
+               try {
@@ -201,3 +199,3 @@
-               return createBigInteger(numeric);
-           }
+

```

Listing 66: "The generated patch for the bug Lang 44"

Number of tests that execute the patch: 3

Execution time: 29 seconds

3.2 Lang 51

```

--- /tmp/lang_51_Nopol/src/java/org/apache/commons/lang/BooleanUtils.java
+++ /tmp/lang_51_Nopol/src/java/org/apache/commons/lang/BooleanUtils.java
@@ -676,6 +676,6 @@
-   }
-   if (ch == 'Y') {
-       return
-           (str.charAt(1) == 'E' || str.charAt(1) == 'e') &&
-           (str.charAt(2) == 'S' || str.charAt(2) == 's');
+   if (str!=null) {
+       return
+           (str.charAt(1) == 'E' || str.charAt(1) == 'e') &&

```

```

+           (str.charAt(2) == 'S' || str.charAt(2) == 's');
+       }

```

Listing 67: "The generated patch for the bug Lang 51"

Number of tests that execute the patch: 1

Execution time: 28 seconds

3.3 Lang 53

```

--- /tmp/lang_53_Nop01/src/java/org/apache/commons/lang/time/DateUtils.java
+++ /tmp/lang_53_Nop01/src/java/org/apache/commons/lang/time/DateUtils.java
@@ -665,3 +665,5 @@
         date.setTime(time);
         val.setTime(date);
+       if (org.apache.commons.lang.time.DateUtils.RANGE_WEEK_CENTER == millisecs) {
+           val.setTime(date);
+       }
+   }

```

Listing 68: "The generated patch for the bug Lang 53"

Number of tests that execute the patch: 6

Execution time: 35 seconds

3.4 Lang 58

```

--- /tmp/lang_58_Nop01/src/java/org/apache/commons/lang/math/NumberUtils.java
+++ /tmp/lang_58_Nop01/src/java/org/apache/commons/lang/math/NumberUtils.java
@@ -451,6 +451,3 @@
         case 'L' :
             if (dec == null
                 && exp == null
                 && isDigits(numeric.substring(1))
                 && (numeric.charAt(0) == '-' || Character.isDigit(numeric.charAt(0))))
             {
+                if (((dec == null) && (exp == null))) {
+                    try {
@@ -461,3 +458,3 @@
+                    return createBigInteger(numeric);
+                }

```

Listing 69: "The generated patch for the bug Lang 58"

Number of tests that execute the patch: 3

Execution time: 10 minutes, 26 seconds

4 Math

Nop01 repairs 24 bugs in the project Math.

4.1 Math 2

```

--- /tmp/math_2_Nop01/src/main/java/org/apache/commons/math3/distribution/
    AbstractIntegerDistribution.java
+++ /tmp/math_2_Nop01/src/main/java/org/apache/commons/math3/distribution/
    AbstractIntegerDistribution.java
@@ -137,3 +137,5 @@
         if (tmp < upper) {
             upper = ((int) Math.ceil(tmp)) - 1;
+           if (tmp == -1) {
+               upper = ((int) Math.ceil(tmp)) - 1;
+           }

```

Listing 70: "The generated patch for the bug Math 2"

Number of tests that execute the patch: 63

Execution time: 6 minutes, 18 seconds

4.2 Math 4

```

--- /tmp/math_4_Nop01/src/main/java/org/apache/commons/math3/geometry/euclidean/twod/Line.java
+++ /tmp/math_4_Nop01/src/main/java/org/apache/commons/math3/geometry/euclidean/twod/Line.java
@@ -199,3 +199,5 @@
     if (FastMath.abs(d) < 1.0e-10) {
-        return null;
+        if (((d) != (org.apache.commons.math3.geometry.euclidean.twod.Line.this.
+            originOffset)) && (other!=null)) || (other.sin < 1)) {
+            return null;
+        }
     }
 }

```

Listing 71: "The generated patch for the bug Math 4"

Number of tests that execute the patch: 24

Execution time: 6 minutes, 7 seconds

4.3 Math 7

```

--- /tmp/math_7_Nop01/src/main/java/org/apache/commons/math3/ode/AbstractIntegrator.java
+++ /tmp/math_7_Nop01/src/main/java/org/apache/commons/math3/ode/AbstractIntegrator.java
@@ -372,3 +372,5 @@
     }
-    return eventT;
+    if ((org.apache.commons.math3.ode.AbstractIntegrator.this.stepHandlers.
+        size()) != (eventY.length)) {
+        return eventT;
+    }
}

```

Listing 72: "The generated patch for the bug Math 7"

Number of tests that execute the patch: 14

Execution time: 20 minutes, 6 seconds

4.4 Math 24

```

--- /tmp/math_24_Nop01/src/main/java/org/apache/commons/math3/analysis/FunctionUtils.java
+++ /tmp/math_24_Nop01/src/main/java/org/apache/commons/math3/analysis/FunctionUtils.java
@@ -145,3 +145,5 @@
     for (int i = 1; i < f.length; i++) {
-        r += f[i].value(x);
+        if ((0 < r) || (!(-1 <= r))) {
+            r += f[i].value(x);
+        }
     }
}

```

Listing 73: "The generated patch for the bug Math 24"

Number of tests that execute the patch: 2

Execution time: 9 minutes, 53 seconds

4.5 Math 28

```

--- /tmp/math_28_Nop01/src/main/java/org/apache/commons/math3/optimization/linear/SimplexSolver
.java
+++ /tmp/math_28_Nop01/src/main/java/org/apache/commons/math3/optimization/linear/SimplexSolver
.java
@@ -150,3 +150,5 @@
    }
-    return minRow;
+    if (minRatioPositions.isEmpty()) {
+        return minRow;
+    }
}

```

Listing 74: "The generated patch for the bug Math 28"

Number of tests that execute the patch: 4

Execution time: 10 minutes, 31 seconds

4.6 Math 33

```

--- /tmp/math_33_Nop01/src/main/java/org/apache/commons/math3/optimization/linear/
SimplexTableau.java
+++ /tmp/math_33_Nop01/src/main/java/org/apache/commons/math3/optimization/linear/
SimplexTableau.java
@@ -338,3 +338,5 @@
    if (Precision.compareTo(entry, 0d, maxUlp) > 0) {
-        columnsToDrop.add(i);

```

```

+         if (org.apache.commons.math3.optimization.linear.SimplexTableau.this.
+             numSlackVariables < org.apache.commons.math3.optimization.linear.SimplexTableau.this.
+             constraints.size()) {
+             columnsToDrop.add(i);
+         }
+     }

```

Listing 75: "The generated patch for the bug Math 33"

Number of tests that execute the patch: 5

Execution time: 9 minutes, 59 seconds

4.7 Math 39

```

--- /tmp/math_39_Nopool/src/main/java/org/apache/commons/math/ode/nonstiff/
    AdaptiveStepsizeIntegrator.java
+++ /tmp/math_39_Nopool/src/main/java/org/apache/commons/math/ode/nonstiff/
    AdaptiveStepsizeIntegrator.java
@@ -263,3 +263,5 @@
     ratio = yDot0[j] / scale[j];
-    yDotOnScale2 += ratio * ratio;
+    if ((scale.length) != (org.apache.commons.math.ode.nonstiff.AdaptiveStepsizeIntegrator.
+        this.maxStep)) {
+        yDotOnScale2 += ratio * ratio;
+    }

```

Listing 76: "The generated patch for the bug Math 39"

Number of tests that execute the patch: 101

Execution time: 6 minutes, 49 seconds

4.8 Math 40

```

--- /tmp/math_40_Nopool/src/main/java/org/apache/commons/math/analysis/solvers/
    BracketingNthOrderBrentSolver.java
+++ /tmp/math_40_Nopool/src/main/java/org/apache/commons/math/analysis/solvers/
    BracketingNthOrderBrentSolver.java
@@ -259,3 +259,3 @@
-
-    // we try again with a lower interpolation order
+    if (signChangeIndex - start >= end - signChangeIndex) {
+    if (((signChangeIndex - start) >= (end - signChangeIndex)) || (xA <= org.
+        apache.commons.math.analysis.solvers.BacketingNthOrderBrentSolver.REDUCTION_FACTOR)) {
+        // we have more points before the sign change, drop the lowest point

```

Listing 77: "The generated patch for the bug Math 40"

Number of tests that execute the patch: 19

Execution time: 10 minutes, 33 seconds

4.9 Math 41

```

--- /tmp/math_41_Nopool/src/main/java/org/apache/commons/math/stat/descriptive/moment/Mean.java
+++ /tmp/math_41_Nopool/src/main/java/org/apache/commons/math/stat/descriptive/moment/Mean.java
@@ -216,3 +216,5 @@
-    }
-    return xbarw + (correction/sumw);
+    if (xbarw < length) {
+        return xbarw + (correction/sumw);
+    }

```

Listing 78: "The generated patch for the bug Math 41"

Number of tests that execute the patch: 6

Execution time: 4 minutes, 31 seconds

4.10 Math 42

```

--- /tmp/math_42_Nopool/src/main/java/org/apache/commons/math/optimization/linear/SimplexTableau
    .java
+++ /tmp/math_42_Nopool/src/main/java/org/apache/commons/math/optimization/linear/SimplexTableau
    .java
@@ -346,3 +346,5 @@
-    if (getBasicRow(col) == null) {
-        columnsToDrop.add(col);
+    if (1 <= org.apache.commons.math.optimization.linear.SimplexTableau.this.
+        numSlackVariables) {
+        columnsToDrop.add(col);

```


Listing 79: "The generated patch for the bug Math 42"

Number of tests that execute the patch: 16

Execution time: 4 minutes, 39 seconds

4.11 Math 44

```

--- /tmp/math_44_Nopol/src/main/java/org/apache/commons/math/ode/AbstractIntegrator.java
+++ /tmp/math_44_Nopol/src/main/java/org/apache/commons/math/ode/AbstractIntegrator.java
@@ -286,3 +286,5 @@
     }
-    statesInitialized = true;
+    if (1 == org.apache.commons.math.ode.AbstractIntegrator.this.stepHandlers.size
+    ()) {
+        statesInitialized = true;
+    }
}

```

Listing 80: "The generated patch for the bug Math 44"

Number of tests that execute the patch: 137

Execution time: 7 minutes, 10 seconds

4.12 Math 49

```
-- /tmp/math_49_Nopol/src/main/java/org/apache/commons/math/linear/OpenMapRealVector.java
+++ /tmp/math_49_Nopol/src/main/java/org/apache/commons/math/linear/OpenMapRealVector.java
@@ -666,3 +666,5 @@
    } else if (entries.containsKey(index)) {
-        entries.remove(index);
+        if (org.apache.commons.math.linear.OpenMapRealVector.DEFAULT_ZERO_TOLERANCE == org
+        .apache.commons.math.linear.OpenMapRealVector.this.epsilon) {
+            entries.remove(index);
+        }
    }
}
```

Listing 81: "The generated patch for the bug Math 49"

Number of tests that execute the patch: 3

Execution time: 3 minutes, 18 seconds

4.13 Math 50

```

--- /tmp/math_50_Nopol/src/main/java/org/apache/commons/math/analysis/solvers/BaseSecantSolver.
    java
+++ /tmp/math_50_Nopol/src/main/java/org/apache/commons/math/analysis/solvers/BaseSecantSolver.
    java
@@ -236,15 +236,17 @@

                                atol)) {

-                switch (allowed) {
-                case ANY_SIDE:
-                    return x1;
-                case LEFT_SIDE:
-                    return inverted ? x1 : x0;
-                case RIGHT_SIDE:
-                    return inverted ? x0 : x1;
-                case BELOW_SIDE:
-                    return (f1 <= 0) ? x1 : x0;
-                case ABOVE_SIDE:
-                    return (f1 >= 0) ? x1 : x0;
-                default:
-                    throw new MathInternalError();
+                if (((atol) != (org.apache.commons.math.analysis.solvers.BaseSecantSolver.
+DEFAULT_ABSOLUTE_ACCURACY)) && (org.apache.commons.math.analysis.solvers.BaseSecantSolver.
+this.method!=null)) || (f0 <= atol)) {
+                    switch (allowed) {
+                    case ANY_SIDE:
+                        return x1;
+                    case LEFT_SIDE:
+                        return inverted ? x1 : x0;
+                    case RIGHT_SIDE:
+                        return inverted ? x0 : x1;
+                    case BELOW_SIDE:
+                        return (f1 <= 0) ? x1 : x0;
+                    case ABOVE_SIDE:
+                        return (f1 >= 0) ? x1 : x0;
+                    default:

```

```

+         throw new MathInternalError();
+     }
+ }

```

Listing 82: "The generated patch for the bug Math 50"

Number of tests that execute the patch: 21

Execution time: 8 minutes, 22 seconds

4.14 Math 57

```

--- /tmp/math_57_Nopol/src/main/java/org/apache/commons/math/stat/clustering/
    EuclideanIntegerPoint.java
+++ /tmp/math_57_Nopol/src/main/java/org/apache/commons/math/stat/clustering/
    EuclideanIntegerPoint.java
@@ -84,4 +84,6 @@
     for (int i = 0; i < point.length; i++) {
-         if (point[i] != otherPoint[i]) {
-             return false;
+         if (((otherPoint[i])) != (otherPoint.length)) {
+             if (point[i] != otherPoint[i]) {
+                 return false;
+             }
+         }
     }

```

Listing 83: "The generated patch for the bug Math 57"

Number of tests that execute the patch: 5

Execution time: 3 minutes, 10 seconds

4.15 Math 58

```

--- /tmp/math_58_Nopol/src/main/java/org/apache/commons/math/analysis/function/Gaussian.java
+++ /tmp/math_58_Nopol/src/main/java/org/apache/commons/math/analysis/function/Gaussian.java
@@ -181,4 +181,6 @@
     }
-     if (param[2] <= 0) {
-         throw new NotStrictlyPositiveException(param[2]);
+     if ((param[2]) == 0) {
+         if (param[2] <= 0) {
+             throw new NotStrictlyPositiveException(param[2]);
+         }
+     }

```

Listing 84: "The generated patch for the bug Math 58"

Number of tests that execute the patch: 10

Execution time: 2 minutes, 54 seconds

4.16 Math 69

```

--- /tmp/math_69_Nopol/src/main/java/org/apache/commons/math/stat/correlation/
    PearsonsCorrelation.java
+++ /tmp/math_69_Nopol/src/main/java/org/apache/commons/math/stat/correlation/
    PearsonsCorrelation.java
@@ -192,3 +192,5 @@
         outMatrix.setEntry(i, j, corr);
-         outMatrix.setEntry(j, i, corr);
+         if (2 < nVars) {
+             outMatrix.setEntry(j, i, corr);
+         }
     }

```

Listing 85: "The generated patch for the bug Math 69"

Number of tests that execute the patch: 11

Execution time: 33 seconds

4.17 Math 73

```

--- /tmp/math_73_Nopol/src/main/java/org/apache/commons/math/analysis/solvers/
    UnivariateRealSolverImpl.java
+++ /tmp/math_73_Nopol/src/main/java/org/apache/commons/math/analysis/solvers/
    UnivariateRealSolverImpl.java
@@ -224,6 +224,6 @@
     protected void verifySequence(final double lower, final double initial, final double upper
     ) {
-         if (!isSequence(lower, initial, upper)) {

```

```

+         if (((!(1) != (lower))) && (org.apache.commons.math.analysis.solvers.
UnivariateRealSolverImpl.this.result < org.apache.commons.math.analysis.solvers.
UnivariateRealSolverImpl.this.defaultFunctionValueAccuracy)) || (initial <= lower)) {
+             throw MathRuntimeException.createIllegalArgumentException(
-                 "invalid interval, initial value parameters: lower={0}, initial={1},
upper={2}",
-                 lower, initial, upper);
+                 "invalid interval, initial value parameters: lower={0}, initial={1}, upper={2}",
+                 lower, initial, upper);
+         }

```

Listing 86: "The generated patch for the bug Math 73"

Number of tests that execute the patch: 5

Execution time: 34 seconds

4.18 Math 78

```

--- /tmp/math_78_Nopol/src/main/java/org/apache/commons/math/analysis/solvers/BrentSolver.java
+++ /tmp/math_78_Nopol/src/main/java/org/apache/commons/math/analysis/solvers/BrentSolver.java
@@ -260,3 +260,3 @@
+         // it should NOT be replaced by proximity test
+         if (x0 == x2) {
-         if (((1 < x2) && !(y0 <= i))) || (x0 == x2)) {
+             // Linear interpolation.

```

Listing 87: "The generated patch for the bug Math 78"

Number of tests that execute the patch: 116

Execution time: 15 minutes, 41 seconds

4.19 Math 80

```

--- /tmp/math_80_Nopol/src/main/java/org/apache/commons/math/linear/EigenDecompositionImpl.java
+++ /tmp/math_80_Nopol/src/main/java/org/apache/commons/math/linear/EigenDecompositionImpl.java
@@ -1138,3 +1138,5 @@
+         final double tmp = work[i + k];
+         work[i + k] = work[j - k];
+         if (org.apache.commons.math.linear.EigenDecompositionImpl.this.cachedD!=
null) {
+             work[i + k] = work[j - k];
+         }
+         work[j - k] = tmp;

```

Listing 88: "The generated patch for the bug Math 80"

Number of tests that execute the patch: 1

Execution time: 39 seconds

4.20 Math 81

```

--- /tmp/math_81_Nopol/src/main/java/org/apache/commons/math/linear/EigenDecompositionImpl.java
+++ /tmp/math_81_Nopol/src/main/java/org/apache/commons/math/linear/EigenDecompositionImpl.java
@@ -1585,4 +1585,4 @@
+         case 1 : // one eigenvalue just deflated. use dMin1, dN1 for dMin and dN.
-         if (dMin1 == dN1 && dMin2 == dN2) {
+             if (org.apache.commons.math.linear.EigenDecompositionImpl.this.main!=null) {
+                 // cases 7 and 8.
@@ -1618,3 +1618,3 @@
+                 } else {
-                 // case 9.

```

Listing 89: "The generated patch for the bug Math 81"

Number of tests that execute the patch: 4

Execution time: 40 seconds

4.21 Math 85

```

--- /tmp/math_85_Nopol/src/java/org/apache/commons/math/analysis/solvers/
UnivariateRealSolverUtils.java
+++ /tmp/math_85_Nopol/src/java/org/apache/commons/math/analysis/solvers/
UnivariateRealSolverUtils.java
@@ -197,9 +197,9 @@

```

```

-         if (fa * fb >= 0.0 ) {
+         if (maximumIterations == initial) {
+             throw new ConvergenceException(
-                 "number of iterations={0}, maximum iterations={1}, " +
-                 "initial={2}, lower bound={3}, upper bound={4}, final a value={5}, " +
-                 "final b value={6}, f(a)={7}, f(b)={8}",
-                 numIterations, maximumIterations, initial,
-                 lowerBound, upperBound, a, b, fa, fb);
+                 "number of iterations={0}, maximum iterations={1}, " +
+                 "initial={2}, lower bound={3}, upper bound={4}, final a value={5}, " +
+                 "final b value={6}, f(a)={7}, f(b)={8}",
+                 numIterations, maximumIterations, initial,
+                 lowerBound, upperBound, a, b, fa, fb);
+         }

```

Listing 90: "The generated patch for the bug Math 85"

Number of tests that execute the patch: 17

Execution time: 37 seconds

4.22 Math 87

```

--- /tmp/math_87_Nopol/src/java/org/apache/commons/math/optimization/linear/SimplexTableau.java
+++ /tmp/math_87_Nopol/src/java/org/apache/commons/math/optimization/linear/SimplexTableau.java
@@ -160,4 +160,6 @@
+         if (!restrictToNonNegative) {
+             matrix[row][getSlackVariableOffset() - 1] =
+                 if ((1) != (constraints.size())) {
+                     matrix[row][getSlackVariableOffset() - 1] =
+                         getInvertedCoefficientSum(constraint.getCoefficients());
+                 }
+         }

```

Listing 91: "The generated patch for the bug Math 87"

Number of tests that execute the patch: 12

Execution time: 50 seconds

4.23 Math 88

```

--- /tmp/math_88_Nopol/src/java/org/apache/commons/math/optimization/linear/SimplexTableau.java
+++ /tmp/math_88_Nopol/src/java/org/apache/commons/math/optimization/linear/SimplexTableau.java
@@ -338,3 +338,5 @@
+         if (tableau.getEntry(basicRow, j) == 1) {
+             coefficients[i] = 0;
+             if (org.apache.commons.math.optimization.linear.SimplexTableau.this.
+                 constraints.size() < org.apache.commons.math.optimization.linear.SimplexTableau.this.
+                 numDecisionVariables) {
+                 coefficients[i] = 0;
+             }
+         }

```

Listing 92: "The generated patch for the bug Math 88"

Number of tests that execute the patch: 3

Execution time: 23 seconds

4.24 Math 105

```

--- /tmp/math_105_Nopol/src/java/org/apache/commons/math/stat/regression/SimpleRegression.java
+++ /tmp/math_105_Nopol/src/java/org/apache/commons/math/stat/regression/SimpleRegression.java
@@ -107,3 +107,5 @@
+         xbar = x;
+         ybar = y;
+         if (y <= x) {
+             ybar = y;
+         }
+     } else {

```

Listing 93: "The generated patch for the bug Math 105"

Number of tests that execute the patch: 9

Execution time: 35 seconds

5 Mockito

Nopol repairs 2 bugs in the project Mockito.

5.1 Mockito 29

```
--- /tmp/mockito_29_Nopol/src/org/mockito/internal/matchers/Same.java
+++ /tmp/mockito_29_Nopol/src/org/mockito/internal/matchers/Same.java
@@ -28,3 +28,5 @@
     appendQuoting(description);
     description.appendText(wanted.toString());
+    if (org.mockito.internal.matchers.Same.this.wanted!=null) {
+        description.appendText(wanted.toString());
+    }
     appendQuoting(description);
```

Listing 94: "The generated patch for the bug Mockito 29"

Number of tests that execute the patch: 5

Execution time: 18 seconds

5.2 Mockito 38

```
--- /tmp/mockito_38_Nopol/src/org/mockito/internal/matchers/Equals.java
+++ /tmp/mockito_38_Nopol/src/org/mockito/internal/matchers/Equals.java
@@ -19,3 +19,3 @@
     public boolean matches(Object actual) {
-        if (this.wanted == null) {
+        if (!(actual!=null) && (actual!=null)) {
             return actual == null;
         }
```

Listing 95: "The generated patch for the bug Mockito 38"

Number of tests that execute the patch: 173

Execution time: 3 minutes, 12 seconds

6 Time

Nopol repairs 8 bugs in the project Time.

6.1 Time 4

```
--- /tmp/time_4_Nopol/src/main/java/org/joda/time/Partial.java
+++ /tmp/time_4_Nopol/src/main/java/org/joda/time/Partial.java
@@ -458,3 +458,5 @@
     newTypes[i] = fieldType;
     newValues[i] = value;
+    if (((20) - (value + newTypes.length) < value) || ((2) != (org.joda.time.Partial.
+        this.iTypes.length))) {
+        newValues[i] = value;
+    }
     System.arraycopy(iTypes, i, newTypes, i + 1, newTypes.length - i - 1);
```

Listing 96: "The generated patch for the bug Time 4"

Number of tests that execute the patch: 75

Execution time: 56 seconds

6.2 Time 7

```
--- /tmp/time_7_Nopol/src/main/java/org/joda/time/format/DateTimeParserBucket.java
+++ /tmp/time_7_Nopol/src/main/java/org/joda/time/format/DateTimeParserBucket.java
@@ -358,3 +358,5 @@
     saveField(DateTimeFieldType.year(), iDefaultYear);
     return computeMillis(resetFields, text);
+    if (resetFields) {
+        return computeMillis(resetFields, text);
+    }
 }
```

Listing 97: "The generated patch for the bug Time 7"

Number of tests that execute the patch: 84

Execution time: 43 seconds

6.3 Time 11

```

--- /tmp/time_11_Nopol/src/main/java/org/joda/time/tz/DateTimeZoneBuilder.java
+++ /tmp/time_11_Nopol/src/main/java/org/joda/time/tz/DateTimeZoneBuilder.java
@@ -1457,7 +1457,6 @@
     if (tailZone != null) {
-        if (tailZone.iStartRecurrence.getNameKey()
-            .equals(tailZone.iEndRecurrence.getNameKey())) {
+        if (id.length()==0) {
+            if (ZoneInfoCompiler.verbose()) {
+                System.out.println("Fixing duplicate recurrent name key - " +
+                    tailZone.iStartRecurrence.getNameKey());
+                tailZone.iStartRecurrence.getNameKey();
+            }
@@ -1465,12 +1464,12 @@
        tailZone = new DSTZone(
-            tailZone.getID(),
-            tailZone.iStandardOffset,
-            tailZone.iStartRecurrence.renameAppend("-Summer"),
-            tailZone.iEndRecurrence);
+            tailZone.getID(),
+            tailZone.iStandardOffset,
+            tailZone.iStartRecurrence.renameAppend("-Summer"),
+            tailZone.iEndRecurrence);
+    } else {
        tailZone = new DSTZone(
-            tailZone.getID(),
-            tailZone.iStandardOffset,
-            tailZone.iStartRecurrence,
-            tailZone.iEndRecurrence.renameAppend("-Summer"));
+            tailZone.getID(),
+            tailZone.iStandardOffset,
+            tailZone.iStartRecurrence,
+            tailZone.iEndRecurrence.renameAppend("-Summer"));
+    }

```

Listing 98: "The generated patch for the bug Time 11"

Number of tests that execute the patch: 18

Execution time: 53 seconds

6.4 Time 12

```

--- /tmp/time_12_Nopol/src/main/java/org/joda/time/LocalDateTime.java
+++ /tmp/time_12_Nopol/src/main/java/org/joda/time/LocalDateTime.java
@@ -662,3 +662,3 @@
    // override to perform faster
-    if (this == partial) {
+    if ((this == partial) || (!(org.joda.time.LocalDateTime.MONTH_OF_YEAR < org.joda.
+        time.LocalDateTime.this.iLocalMillis))) {
        return true;

```

Listing 99: "The generated patch for the bug Time 12"

Number of tests that execute the patch: 159

Execution time: 1 minute, 29 seconds

6.5 Time 14

```

--- /tmp/time_14_Nopol/src/main/java/org/joda/time/chrono/BasicMonthOfYearDateTimeField.java
+++ /tmp/time_14_Nopol/src/main/java/org/joda/time/chrono/BasicMonthOfYearDateTimeField.java
@@ -209,3 +209,3 @@
    // month is largest field and being added to, such as month-day
-    if (DateTimeUtils.isContiguous(partial)) {
+    if (((!(fieldIndex) != (1)) && (valueToAdd <= values.length))) || (valueToAdd < -1))
+    {
        long instant = 0L;

```

Listing 100: "The generated patch for the bug Time 14"

Number of tests that execute the patch: 63

Execution time: 37 seconds

6.6 Time 16

```

--- /tmp/time_16_Nopol/src/main/java/org/joda/time/format/DateTimeParserBucket.java
+++ /tmp/time_16_Nopol/src/main/java/org/joda/time/format/DateTimeParserBucket.java
@@ -357,3 +357,5 @@
    saveField(DateTimeFieldType.year(), iDefaultYear);
-    return computeMillis(resetFields, text);
+    if (resetFields) {
+        return computeMillis(resetFields, text);

```

```
+      }
+    }
```

Listing 101: "The generated patch for the bug Time 16"

Number of tests that execute the patch: 54

Execution time: 40 seconds

6.7 Time 18

```
--- /tmp/time_18_Nopol/src/main/java/org/joda/time/chrono/BasicChronology.java
+++ /tmp/time_18_Nopol/src/main/java/org/joda/time/chrono/BasicChronology.java
@@ -604,3 +604,5 @@
     FieldUtils.verifyValueBounds(DateTimeFieldType.monthOfYear(), monthOfYear, 1,
        getMaxMonth(year));
-    FieldUtils.verifyValueBounds(DateTimeFieldType.dayOfMonth(), dayOfMonth, 1,
+    FieldUtils.verifyValueBounds(DateTimeFieldType.dayOfMonth(), dayOfMonth, 1,
        getDaysInYearMonth(year, monthOfYear));
+    if ((!(10 == monthOfYear)) && (((31) - (2)) != (dayOfMonth))) {
+        FieldUtils.verifyValueBounds(DateTimeFieldType.dayOfMonth(), dayOfMonth, 1,
+        getDaysInYearMonth(year, monthOfYear));
+    }
     return getYearMonthDayMillis(year, monthOfYear, dayOfMonth);
```

Listing 102: "The generated patch for the bug Time 18"

Number of tests that execute the patch: 3456

Execution time: 7 minutes, 48 seconds

6.8 Time 19

```
--- /tmp/time_19_Nopol/src/main/java/org/joda/time/DateTimeZone.java
+++ /tmp/time_19_Nopol/src/main/java/org/joda/time/DateTimeZone.java
@@ -899,3 +899,3 @@
     }
-    } else if (offsetLocal > 0) {
+    } else if (org.joda.time.DateTimeZone.this.iID!=null) {
+        long prev = previousTransition(instantAdjusted);
```

Listing 103: "The generated patch for the bug Time 19"

Number of tests that execute the patch: 2139

Execution time: 3 minutes, 24 seconds

References

- [1] Raphaël Bolze, Franck Cappello, Eddy Caron, Michel Daydé, Frédéric Desprez, Emmanuel Jeannot, Yvon Jégou, Stephane Lanteri, Julien Leduc, Noredine Melab, et al. Grid'5000: a large scale and highly reconfigurable experimental grid testbed. volume 20, pages 481–494. SAGE Publications, 2006.
- [2] René Just, Darioush Jalali, and Michael D. Ernst. Defects4J: A database of existing faults to enable controlled testing studies for Java programs. In *Proceedings of the International Symposium on Software Testing and Analysis (ISSTA)*, pages 437–440, San Jose, CA, USA, July 23–25 2014.
- [3] Jifeng Xuan, Matias Martinez, Favio DeMarco, Maxime Clément, Sebastian Lamelas, Thomas Durieux, Daniel Le Berre, and Martin Monperrus. Nopol: Automatic Repair of Conditional Statement Bugs in Java Programs. *IEEE Transactions on Software Engineering*, 43:34–55, 2016.